46. (New) The input device according to claim 39 comprising:

switch means with the inertial gyroscopic means for manual activation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of the housing.

47. (New) The input device according to claim 43 comprising:

switch means mounted with said sensing means and said inertial gyroscopic means for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation.

48. (New) The input device according to claim 45 comprising:

switch means on said housing means for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of said housing means.

REMARKS

Responsive to the Examiner's note in Paper #13, Applicant submits that the Amendment and Response filed September 16, 2002 **was** in compliance with 37 CFR §1.121, particularly subsection (c)(3), in that no claim changes were made to

the claims as initially submitted in this reissue application, and therefore no marked-up versions were required to be filed, again.

However, in order to advance the prosecution of this application and to obviate any bases for procedural objections, Applicant is again submitting herewith both clean and marked-up versions of the claims that remain unchanged from the claims as initially presented upon filing of this reissue application.

In addition, for the Examiner's convenience, Applicant is also reproducing below in compliance with 37 CFR §1.173 (b)(1) the portions of the specification other than the claims that were previously submitted in the Supplemental Amendment filed on or about March 13, 2003 for correction in this reissue application, as follows:

Column 1, delete the paragraph between lines 31-38 and insert therefor:

--However, a mouse, requires a relatively large and flat 2-dimensional surface on which to move. Typically, this surface must be unobstructed and dedicated to mouse movement and measure over 9"x9"[. As] <u>as</u> a result. Other controllers, such as the trackball and joystick, are often used when flat surfaces are unavailable, as in the case of portable computers. However, trackballs and joysticks are constrained to use on a surface of practical applications.--

Column 1, delete the paragraph between lines 39-64 and insert therefor:

--Further, trackballs, joysticks, keys and mice are not mobile in free space nor do they provide three-dimensional output. One controller which is mobil in space is taught by Ronald E. Milner in this U.S. Pat. No. 4,682,152. "Sonic Positioning Device," issued Jan. 25, 1990. This device senses the position of a controller device in three dimensions by sensing the position of an ultrasonic transmitter relative to an array of receivers. However, this device is not a true pointing device as it senses position rather than a vector from the device. Since the controller must be repositioned in space, rather than simply reoriented, relatively large hand movements are required to define cursor movements. Another controller [mobil] <u>mobile</u> in free space, the Mattel Power Glove video game controller, incorporates two ultrasonic transmitters in a single controller and thus can determine a position [as web as] <u>and</u> define a "pointing" vector through the two transmitters. However, both of these ultrasonic controllers are based on ranging techniques and thus have range and resolution limitations. Specifically, both must be used in conjunction with an array of receivers to determine the exact position of the controllers. This results in reduced accuracy as the controller is moved to a position more distant from the receivers. Further, these controllers are only [use able] <u>usable</u> in an active volume of space defined by those receivers. Further still, both are limited to use in relatively noise-free environments.--

Column 2, delete the paragraph between lines 18-30 and insert therefor:

--Accordingly, it is desirable to provide a hand-held computer control device which has a long range and high resolution. Further, the controller should not be constrained to use on a flat surface or within a confined space. Further, it is desirable to have a controller which responds to a vector defined by the controller, i.e., responds to "pointing" of the controller, as opposed to merely detecting the position of the controller. It is desirable to have a controller which is self-contained and not subject to interference [form] <u>from</u> outside sources of noise or subject to reduced accuracy as it is moved distant from an array of receivers. Further, it is desirable to provide a controller that produces three-dimensional output.--

Column 4, delete the paragraph between lines 30-56 and insert therefor:

--Cabling 180 transmits power from an [interlace] <u>interface</u> box 185 to outer housing 175 and returns data signals from shaft angle encoder sensing optics 165. In the preferred embodiment interface box 185 translates signals from the optical sensing system 165 into serial data for an RS-232 port. Wall adapter 190 provides D.C. power for motor 105 and [shalt] <u>shaft</u> angle encoder sensing optics 165.

The construction details of the inner and outer gimbals [is] <u>are</u> shown in further detail in FIG. 2. FIG. 2 is an expanded perspective view of inner gimbal 115 and bearing 122. Inner gimbal 115 includes a circular plug 205 which fits within the inner race of bearing 122. A conductive pin 210, having a diameter smaller than that of plug 205, is mounted concentrically with plug 205 and electrically coupled to motor 205. Pin 210 is preferably made of a low-friction conductive material such as carbon-teflon and designed to protrude from the inner race of bearing 122. The diameter of pin 210 is smaller than the diameter of the inner race so as not <u>to</u> contact the inner race and to minimize the friction of the rotating contact. A stainless steel spring 215 is mounted to gimbal frame 135 and aligned with and in electrical contact with protruding surface 220 of pin 210. Spring 215 is electrically coupled to a D.C. power source through outer gimbal 140. Spring 215 presses against pin 210 providing a low friction electrical connection between gimbal frame 135 and inner module 110. Inner gimbal 120 and outer gimbals 140 and 145 are constructed in an identical manner.--

Column 5, delete the paragraph between lines 10-20 and insert therefor:

--[And] <u>A</u> second optical pattern is machined into gimbal frame 135 along a cylindrical section 170 of gimbal frame 135. This pattern interacts with [shalt] <u>shaft</u> angle encoder sensing optics 165 for sensing rotation of gimbal frame 135

around its axis of rotation through gimbals 140 and 145. This cylindrical section is geometrically centered about the axis of rotation of gimbal frame 135, which passes through gimbals 140 and 145. As with the optical pattern on the inner module 110, the optical pattern on gimbal frame 135 is constructed by applying reflective paint to cylindrical section 170 and then machining grooves of 0.015 inch depth and width on the surface of the cylinder.--

Column 5, delete the paragraph between lines 31-67 and insert therefor:

--Shaft angle encoder sensing optics 165 interact with the optical pattern on inner module 110 so as to determine the rotation of the inner module 110 about its axis of rotation. More specifically, shaft angle encoder sensing optic 165 include sources for illuminating the patterns, lenses for focusing images of the patterns, and photodetectors for [detect a] <u>detecting</u> dark or light areas. Referring to FIG. 3, a first LED 305 is mounted to shock frame 160 at an angle of 30 degrees from vertical in a plane parallel to the axis through gimbals 140 and 145 so as to floodlight an area 310 of the optical pattern on inner module 110. This area is centered on the "equator" of frame 135 so as to provide maximum range of detectable movement in both directions. Lens 315 and mirror 320 focus and reflect the image of the illuminated optical pattern onto quad photodiode 325. Lens 315 is

an injection molded lens of approximately 1/8 inch in diameter having a focal length of approximately 0.2 inches.

Quad photodiode 325 comprises four photodiodes, 402, 404, 406 and 408, located in a row as illustrated in FIG. 4. The sides of quad photodiode 325 are aligned with the edges of the projected image of the optical pattern on inner module 110. One period of the projected image of the optical pattern on inner module 110 (one light and one dark bar) nominally covers the quad photodiode 325, which comprise four photodiodes centered 0.02 inches apart. Photodiodes 402 and 406 are [counted] <u>coupled</u> to comparator [420] <u>410</u>. Photodiodes 404 and 408 are coupled to comparator [410] <u>420</u>. The output V1 of comparator 410 is thus in phase quadrature with the output V2 of comparator 420. These outputs are then detected by conventional means to determine the rotation of the inner module. An example of phase quadrature resolution is provided in U.S. Pat. No. 4,346,989 titled Surveying Instrument, issued to Alfred F. [Gori] <u>Gort</u> and Charles E. Moore August 31, 1982 and assigned to the Hewlett-Packard Company. A prototype of this embodiment of the present invention results in a resolution of approximately 100 counts per inch.--

Column 6, delete the paragraphs between lines 18-57 and insert therefor:

Quad photodiode 345 comprises four photodiodes located in a row and is identical in construction to quad photodiode 325 illustrated in FIG. 4. The sides of quad photodiode 345 are aligned with the edges of the projected image of the optical pattern on gimbal frame 135. FIG. 5 is an illustration of the preferred embodiment of a gyroscopic pointing device 500 coupled to a computer 502 and computer display 505. Computer 502 is adapted so that changing the pitch of controller 500 relative to the gravity vector [charges] <u>changes</u> the vertical position of cursor 510 on computer display 505. That is, rotating the controller forward ("pitch") causes the cursor to drop on a vertical computer screen, rotating it back causes the cursor to drop on a vertical computer screen, rotating it back causes the cursor to rise, as if the controller was pointing at the cursor. Similarly, rotating the controller from side to side ("roll") changes the horizontal position of cursor 510 on computer display 505. That is, rotating the controller left causes the cursor to move left on a vertical computer screen, rotating it right causes the cursor to move to the right, again, as [it] <u>if</u> the controller was pointing at the cursor. Controller 500 further includes a thumb operated push button 520 and has a rounded hemispherically shaped bottom portion 525 adapted for smoothly rocking on a flat surface when the pitch and roll of controller 500 is varied while resting on a flat surface. This can be a two position switch, where initial pressure on the switch

activates the controller and causes the cursor to move in response to the controller, and a second position of the switch results in a "pick" or "select" signal being transmitted to the computer.

FIG. 6 is a top view of an alternative embodiment of the present invention. FIG. 7 is a top perspective view of the same embodiment. Specifically, FIGS. 6 and 7 illustrate a controller shaped so as to be hand held in a manner such that the palm will be facing down while controller 610 is resting on a flat surface. The under side of controller 610 is rounded to facilitate changes of its orientation with respect to vertical. A palm button 620 is actuated when the controller is grasped, thus permitting the controller to be deactivated, moved or reoriented, then reactivated. A pick button 630 is located for selective activation by a [users lingers] <u>user's fingers</u> in a manner similar to the use of a pick button on a mouse controller.--

Column 7, delete the paragraph between lines 13-34 and insert therefor:

--While the invention has been particularly taught and described with reference to the preferred embodiment, those versed in the art [rill] <u>will</u> appreciate that minor modifications in form and detail may be made without departing from the spirit and scope of the invention. For instance, although the illustrated embodiment teaches one system of shaft angle encoders, many alternative systems

could be used for detecting the orientation of the gyroscopic controller. Further, while the preferred embodiment [leaches] teaches a vertically oriented gyroscope and detection of two angles from vertical such as in an artificial horizon instrument. Other gyroscopic orientations, such as those used for directional gyroscopes, could be substituted. Further, while the present invention teaches the detection of two angles from a vertically oriented gyroscope and one angle from a horizontally oriented gyroscope, two angles could be detected from the horizontal gyroscope, and one from the vertical gyroscope. Further, many techniques equivalent [techniques] to the pendulous technique are known for orienting gyroscopes. Accordingly, all such modifications are embodied within the scope of this patent [as] and properly come within [our] my contribution to the art [and] as are particularly pointed out by the following claims.--

Finally, for the Examiner's convenience, Applicant is also reproducing from the above-referenced Supplemental Amendment, in conformance with 37 CFR §1.173(c), the requisite 1) statement of status that all claims 1-48 are pending herein, and 2) explanations of the support in the disclosure of the patent for the changes that were made to the claims initially presented in this reissue application, as follows:

Support in the specification for the claim changes is submitted to be set forth, *inter alia* as follows:

Claim 1 - supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 2- supported by col. 5, lines 57-67 and Figure 1;

Claim 3 – supported by col. 6, line 25-36 and Figures 1 and 5;

Claim 4 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 5- supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 6 – supported by col. 6, lines 25-36 and col. 5, lines 31-33 and Figures 1 and 5;

Claim 7 – supported by col. 4, lines 57-67 and Figures 1, 3, 5 and 8;

Claim 8 – supported by col. 5, lines 11-13 and Figures 1, 3 and 8;

Claim 13 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 14 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 15 – supported by col. 3, lines 43-52 and col. 6, lines 25-36 and Figures 1 and 5 and 8;

Claim 16 – supported by col. 5, lines 61-67 and col. 6, lines 25-36 and Figures 1 and 5;

Claim 17 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 18 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 19 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 20 – supported by col. 6, lines 53-55 and Figure 5;

Claim 21 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 22 – supported by col. 6, lines 25-36 and Figures 1 and 5;

Claim 23 – supported by col. 6, lines 25-36 and Figures 1, 3 and 5;

Claim 24 – supported by col. 6, lines 25-36 and Figures 1, 3, 5, 6 and 7;

Claim 25 – supported by col. 6, lines 25-36 and col. 3, lines 57-62, and Figures 1, 3, 5, and 8;

Claim 26 – supported by col. 6, lines 25-36 and col. 3, lines 57-62, and Figures 1, 3, and 8;

Claim 27 – supported by col. 3, lines 42-62 and col. 4, line 57 to col. 5, line 14 and Figures 1, 3, and 8;

Claim 28 – supported by col. 5, lines 25-36 and Figure 5;

Claim 29 – supported by col. 5, lines 25-36 and col. 3, lines 42-62 and Figures 1, 3 and 5 to 8;

Claim 30 – supported by col. 3, lines 42-62 and col. 4, line 57 to col. 5, line 47 and Figures 1, 3 and 8;

Claim 31 – supported by col. 6, lines 36-45 and col. 6, lines 53-62 and Figures 1, 3 and 6-8;

Claim 32 – supported by col. 6, lines 36-53 and Figures 1, 3 and 6-8;

Claim 33 – supported by col. 3, lines 42-57 and col. 4, line 57 to col. 5, line 4 and Figures 1, 3 and 6-8;

Claim 34 – supported by col. 6, lines 36-57 and Figures 1, 5, 6, and 7;

Claim 36 – supported by col. 6, lines 36-57 and Figures 1, 5, 6, 7;

Claim 37 – supported by col. 6, lines 36-57 and Figures 1, 5, 6, 7;

Claim 38 – supported by col. 6, lines 36-57 and Figures 1, 5-7;

Claim 39 – supported by col. 3, lines 43-62 and Figures 1, 3, 5, and 8;

Claim 40 – supported by col. 2, line 54 to col. 3, line 11 and Figures 1, 3, and 8;

Claim 41 – supported by col. 6, lines 36-57 and Figures 5-7;

Claim 42 – supported by col. 5, lines 31 to col. 6, line 36 and Figures 3, 4, 5;

Claim 43 – supported by col. 3, lines 56-62 and col. 5, line 31 to col. 6, line 24 and Figures 1, 3, 4;

Claim 44 – supported by col. 5, line 31 to col. 6, line 36 and Figures 1, 3, 4, and 5;

Claim 45 – supported by col. 3, lines 43-62 and col. 5, lines 31-47 and Figures 1, 3, 5;

Claim 46 – supported by col. 6, lines 24-35 and Figures 1, 3, and 5-7;

Claim 47 – supported by col. 6, lines 36-57 and Figures 1, 3, and 5-7; and

Claim 48 - supported by col. 6, lines 36-57 and Figures 1, 3, and 5-7.

This Second Supplemental Amendment is submitted to place this reissue application in compliance with the applicable procedural rules of practice, and to

reproduce in this one document the information the Examiner needs for expeditious examination of this reissue application.

Favorable consideration and allowance of claims 1-48 are solicited.

Respectfully submitted,
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ATTACHMENTS:

- CLAIMS REVISIONS

Serial No.: 09/642,250
Filed: August 17, 2000
Docket No.: 5167

CLAIMS REVISIONS

1. (Amended) A method for effecting movements of [moving] a [displayed] displayable object on [an interactive] a computer graphic display having vertical and horizontal Cartesian coordinate axes in response to one of pitch and yaw rotations of an input device, the method comprising: [the steps of:]

[detecting the pitch or yaw rotation of the device;]

sensing an inertial response to pitch or yaw rotation of the input device to produce [provide] a signal [indicative of] proportional to the at least one of the pitch and yaw rotations of the input device; and

[in response to the signal indicating the detected pitch or yaw movement of the input device,] moving the [displayed] displayable object a distance in a plane defined by the vertical and horizontal axes on the computer graphic display in substantially continuous proportionality to the signal and [,the displayed object being moved] translationally along one of the vertical and horizontal axes in substantially a single direction for each direction in which the input device is rotated.

2. (Amended) [A] The method according to [for effecting translational movements of a displayed object on an interactive computer graphic display as in] claim 1 further comprising: [the steps of:]

selectively inhibiting the input device from producing [a] the signal to permit reorientation of the input device without substantially proportional translational movement of the displayed object on the computer graphic display; and

selectively enabling the input device for producing the signal in response to said one of pitch and yaw rotations of the input device.

3. (Amended) A method for [providing a signal to effect] effecting translational movements of a [displayed] displayable object on [an interactive] a computer graphic display using an input device including an inertial gyroscopic element that is manually movable in free space, the method comprising: [the steps of:]

supporting the inertial gyroscopic element with respect to the input device;

actuating the gyroscopic element to exhibit inertia relative to an inertial axis;

detecting rotational movement of the input device relative to the inertial axis of the gyroscopic element; and

[providing] producing a signal [responsive] substantially proportional to the rotation of the input device relative to the inertial axis for effecting translational

movements of the [displayed] displayable object on the computer graphic display in substantially continuous proportionality to the signal and in a single direction for each direction in which the input device is rotated.

4. (Amended) A method for effecting [providing a signal to effect] translational movements of a [displayed] displayable object on [an interactive] a computer graphic display using an inertial input device that is manually movable in free space, the method comprising: [the steps of:]

detecting[, by inertial means,] rotational movement of the input device about one axis; and

[providing] producing a first signal substantially proportional [responsive] to the rotation of the input device about the one axis for effecting translational movements of the [displayed] displayable object on the computer graphic display in substantially continuous proportionality to the first signal and in a single direction for each direction in which the input device is rotated.

5. (Amended) [A] The method according to claim 4 for [providing signals to effect] effecting the translational movements on [an interactive] the computer graphic display along at least one of first and second coordinate axes[,] using the inertial input device, the method further comprising: [the steps of:]

detecting[, by inertial means,] rotational movement of the input device about a second axis not parallel to the one axis;

[providing] producing a second signal [responsive] substantially proportional to the rotation of the input device about the second axis[; and] for effecting translational movements [on the display] of the displayable object along a first coordinate axis of the computer graphic display in substantially continuous proportionality [response] to the first signal and in a single direction for each direction in which the input device is rotated about the one axis, or along a second coordinate axis of the computer graphic display in [response] substantially continuous proportionality to the second signal and in a single direction for each direction in which the input device is rotated about the second axis.

6. (Amended) [A graphical] An input device for providing a signal to effect translational movements of a [displayed] displayable object on [an interactive] a computer graphic display, comprising:

a hand-held housing adapted for manual movement in free space; and

an inertial gyroscopic element mounted with respect to said housing[, for providing a signal, in response] and responsive to rotation of the housing about an axis for producing a signal substantially proportional to said rotation for effecting[, to effect] translational movements of the [displayed] displayable object on [an interactive] the computer graphic display in substantially continuous

proportionality to the signal and in a single direction for each direction in which the [device] housing is rotated.

7. (Amended) [A graphical] The input device [for providing a signal to effect translational movements of a displayed object on an interactive computer graphic display as in] according to claim 6[,] wherein the gyroscopic element comprises an angular position gyroscope.

8. (Amended) [A graphical] The input device [for providing a signal to effect translational movement of a displayed object on an interactive computer graphic display as in] according to claim 7[,] wherein the angular position gyroscope comprises:

an inertial gyroscopic element disposed to spin about a spin axis;

a gimbal supporting the gyroscopic element with respect to the housing; and

a sensor disposed with respect to the gimbal and the housing for producing said signal in response to rotation of the housing relative to the spin axis.

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13. (Amended) A method for controlling translational movements of a [displayed] displayable object on [an interactive] a computer graphic display having vertical and horizontal Cartesian coordinate axes in response to one of pitch and yaw rotations of an input device, the method comprising: [the steps of:]

detecting the pitch or yaw rotation of the input device;

sensing an inertial response to [provide] produce a signal [indicative of] substantially proportional to at least one of the pitch and yaw rotations of the input device; and

in response to the signal, [detecting pitch or yaw movement of the input device,] moving the [displayed] displayable object a substantially continuously proportional distance in a plane defined by the vertical and horizontal axes on the computer graphic display without rotating the [displayed] displayable object.

14. (Amended) [A graphical] An input device for providing a signal to manipulate translational movements of a [displayed] displayable object on [an] a computer graphic display, comprising:

a hand-held housing adapted for manual movement in free space; and

an inertial gyroscopic element mounted with respect to said housing[, for providing a signal, in response] and responsive to rotation of the housing about an axis for producing a signal substantially proportional to said rotation for manipulating [to manipulate] translational movements of the displayable [displayed] object on the [an interactive] computer graphic display in substantially continuous proportionality to the signal without causing the [displayed] displayable object to be rotated.

15. (Amended) A method for [providing] producing a signal to control translational movements of a displayable [displayed] object on [an interactive] a computer graphic display using an input device including an inertial gyroscopic element that is manually movable in free space, the method comprising: [the steps of:]

supporting the inertial gyroscopic element with respect to the input device;

actuating the gyroscopic element to exhibit inertia relative to an inertial axis;

detecting rotational movement of the input device relative to the inertial axis of the gyroscopic element; and

[providing] producing a signal substantially proportional [responsive] to the rotation of the input device relative to the inertial axis for controlling translational movements of the [displayed] displayable object in substantially continuous proportionality to the signal without causing the [displayed] displayable object to be rotated.

16. (New) An interactive computer graphic display system comprising an input device according to claim 6 and further comprising a circuit coupled to the computer graphic display for effecting the translational movement of a displayable object along one of horizontal and vertical Cartesian coordinate axes of the computer graphic display in substantially continuous proportionality to the signal.

17. (New) A method for effecting movements of a displayable object on a graphic display having vertical and horizontal Cartesian coordinate axes in response to one of pitch and yaw rotations of an input device, the method comprising:

sensing gravitational orientation;

sensing an inertial response to pitch or yaw rotation of the input device relative to the gravitational orientation to produce a signal indicative of at least one of the pitch and yaw rotations of the input device relative to the gravitational orientation; and

moving the displayable object a distance in a plane defined by the vertical and horizontal axes on the computer graphic display translationally along one of the vertical and horizontal axes in substantially a single direction for each direction in which the input device is rotated.

18. (New) The method according to claim 17, further comprising:

selectively inhibiting the input device from producing the signal to permit reorientation of the input device without translational movement of the displayed object on the computer graphic display; and

selectively enabling the input device for producing the signal in response to said one of pitch or yaw rotations of the input device relative to the gravitational orientation.

19. (New) A method for effecting movements of a displayable object on a graphic display having vertical and horizontal Cartesian coordinate axes in response to one of pitch and yaw rotations of an input device including an inertial element, the method comprising:

sensing gravitational orientation;

sensing an inertial response to pitch or yaw rotation of the inertial element relative to the gravitational orientation to produce a signal indicative of at least one of the pitch and yaw rotations of the device relative to the gravitational orientation; and

moving the displayable object a distance in a plane defined by the vertical and horizontal axes on the computer graphic display translationally along one of the vertical and horizontal axes in substantially a single direction for each direction in which the input device is rotated.

20. (New) The method according to claim 19, further comprising:

selectively inhibiting the inertial element from producing the signal to permit reorientation of the input device without translational movement of the displayed object on the computer graphic display; and

selectively enabling the inertial element for producing the signal in response to said one of pitch or yaw rotations of the input device relative to the gravitational orientation.

21. (New) A method for effecting translational movements of a displayable object on a computer graphic display using an input device including an inertial gyroscopic element that is manually movable in free space, the method comprising:

supporting the inertial gyroscopic element with respect to the input device;

actuating the gyroscopic element to exhibit inertia relative to an inertial axis;

sensing gravitational orientation;

detecting rotational movement of the input device about the inertial axis of the gyroscopic element relative to the gravitational orientation; and

producing a signal responsive to the rotation of the input device about the inertial axis relative to the gravitational orientation for effecting translational movements of the displayable object on the computer graphic display in substantially a single direction for each direction in which the input device is rotated.

22. (New) A method for effecting translational movements of a displayable object on a computer graphic display using an inertial input device that is manually movable in free space, the method comprising;

sensing gravitational orientation;

detecting rotational movement of the input device about one axis relative to the gravitational orientation; and

producing a first signal substantially proportional to the rotation of the input device about the one axis for effecting translational movements of the displayable object on the computer graphic display in substantially continuous proportionality to the first signal and in a single direction for each direction in which the input device is rotated.

23. (New) The method according to claim 22 for effecting the translational movements on the computer graphic display along at least one of first and second coordinate axes using the inertial input device, the method further comprising:

detecting rotational movement of the input device about a second axis not parallel to the one axis and relative to the gravitational orientation;

producing a second signal responsive to the rotation of the input device about the second axis for effecting translational movements of the displayable object along a first coordinate axis of the computer graphic display in substantially continuous proportionality to the first signal and in a single direction for each direction in which the input device is rotated about the one axis, or along a second coordinate axis of the computer graphic display in response to the second signal and in a single direction for each direction in which the input device is rotated about the second axis.

24. (New) An input device for producing a signal to effect translational movements of a displayable object on a computer graphic display, comprising:

a hand-held housing adapted for manual movement in free space;

sensing apparatus in the housing to detect gravitational orientation; and

an inertial gyroscopic element mounted with respect to said housing and responsive to rotation of the housing about an axis relative to the gravitational orientation to produce a signal indicative of said rotation for effecting translational movements of the displayable object on the computer graphic display in substantially a single direction for each direction in which the housing is rotated.

25. (New) An input device according to claim 24, wherein the sensing apparatus detects substantially vertical gravitational orientation independent of the orientation of the housing in free space.

26. (New) The input device according to claim 25, wherein the sensing apparatus comprises:

an inertial gyroscopic element disposed to spin about a spin axis;

a gimbal supporting the gyroscopic element with respect to the housing and including a center of mass eccentric the spin axis; and

a sensor communicating with the gimbal for producing an output indicative of the gravitational orientation.

27. (New) An input device for producing a signal to effect translational movement of a displayable object on a graphic display, the input device comprising:

a hand-held housing adapted for manual movement in free space;

an inertial gyroscopic element disposed to spin about one spin axis;

a gimbal supporting the gyroscopic element with respect to the housing and including a center of mass eccentric the spin axis;

a first sensor disposed with respect to the gimbal and the housing and responsive to rotation of the housing relative to one spin axis for producing a signal substantially proportional to said rotation for effecting translational movement of the displayable object in substantially continuous proportionality to the signal and in a single direction for each direction in which the housing is rotated; and

a second sensor in communication with the gimbal for producing an output indicative of gravitational orientation, independent of the orientation of the housing in free space.

28. (New) An interactive computer graphic display system comprising an input device as in claim 24 and further comprising a circuit coupled to the display for effecting translational movement of the displayable object along one of

horizontal and vertical Cartesian coordinate axes of the computer graphic display in response to the rotation of the housing relative to the gravitational orientation.

29. (New) An input device for manipulating translational movements of a displayable object on a computer graphic display, comprising:

a hand-held housing adapted for manual movement in free space;

sensing apparatus in the housing to detect gravitational orientation; and

an inertial element mounted with respect to said housing and responsive to rotation of the housing about an axis relative to gravitational orientation for producing a signal indicative of said rotation for manipulating translational movements of the displayable object on the computer graphic display without causing the displayable object to be rotated.

30. (New) A method for producing a signal to control translational movements of a displayable object on a computer display using an input device including an inertial element that is manually movable in free space, the method comprising:

supporting the inertial element with respect to the input device;

sensing gravitational orientation of the input device in free space;

sensing inertia of the input device relative to the sensed gravitational orientation;

detecting rotational movement of the input device with respect to an inertial axis of the inertial element relative to the gravitational orientation; and

producing a signal substantially proportional to the rotation of the input device about the inertial axis relative to the gravitational orientation for controlling translational movements of the displayable object in response to the signal without causing the displayable object to be rotated.

31. (New) The method according to claim 5 further comprising:

selectively inhibiting producing at least one of the first and second signals to permit reorientation of the device without translational movement of the displayable object on the computer display; and

selectively enabling producing the at least one of the first and second signals in response to rotational movement of the input device about the corresponding one and second axes.

32. (New) The input device according to claim 6 comprising:

a switch mounted on the housing for manual activation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of the housing.

33. (New) An input device for producing a signal to manipulate translational movements of a displayable object on a computer graphic display, comprising:

a hand-held housing adapted for manual movement in free space;

an inertial element mounted with respect to the said housing and responsive to rotation of the housing with respect to an inertial axis of the inertial element for producing a signal indicative of said rotation for manipulating translational movements of the displayable object on the computer graphic display; and

a switch mounted on the housing for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation.

34. (New) The method according to claim 21 further comprising:

selectively inhibiting producing said signal to permit reorientation of the input device without translational movement of the displayable object on the computer graphic display; and

35. (New) The method according to claim 23 further comprising:

selectively inhibiting producing at least one of the first and second signals to permit reorientation of the input device without translational movement of the displayable object on the computer graphic display; and

selectively enabling producing at least the one of the first and second signals in response to said rotation of the input device about the corresponding one and second axes.

36. (New) The input device according to claim 24 comprising:

a switch mounted on said housing for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of the housing.

37. (New) The input device according to claim 29 comprising:

a switch mounted on said housing for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of the housing.

38. (New) The method according to claim 30, further comprising:

selectively inhibiting producing said signal to permit reorientation of the input device without translational movement of the displayable object on the computer graphic display; and

selectively enabling producing said signal in response to said rotation of the input device.

39. (New) An input device for producing a signal to effect translational movements of a displayable object on a computer graphic display, comprising:

an inertial gyroscopic means adapted for manual movement in free space for producing a signal substantially proportional to rotation of the housing about an axis to effect translational movements of the displayable object on the computer graphic display in substantially continuous proportionality to the signal and in a single direction for each direction in which the inertial gyroscopic means is rotated.

40. (Amended) [A graphical] The input device according to claim 39 wherein the inertial gyroscopic means comprises an angular position gyroscope.

41. (New) The input device according to claim 39 further comprising:

switch means mounted with respect to the inertial gyroscopic means for selectively inhibiting producing said signal to permit reorientation of the input device without translational movement of the displayable object in response to said signal, and for selectively enabling the input device to produce said signal.

42. (New) An interactive computer graphic display system comprising an input device as in claim 39 and further comprising circuit means for effecting translational movement of the displayable object along one of horizontal and vertical Cartesian coordinate axes of the computer graphic display in substantially continuous proportionality to the signal.

43. (New) An input device according to claim 39 comprising:

sensing means for detecting gravitational orientation; and

said inertial gyroscopic means produces said signal indicative of said rotation relative to the gravitational orientation.

44. (New) An interactive computer graphic display system comprising an input device as in claim 43 and further comprising circuit means for effecting translational movement of the displayable object along one of horizontal and vertical Cartesian coordinate axes of the computer graphic display in response to the rotation of the housing relative to the gravitational orientation.

45. (New) An input device for manipulating translational movements of a displayable object on a computer graphic display, comprising:

hand-held housing means adapted for manual movement in free space;

sensing means in the housing means for detecting gravitational orientation; and

inertial means mounted with respect to said housing means and responsive to rotation of the housing means about an axis relative to gravitational orientation for producing a signal indicative of said rotation for manipulating translational movements of the displayable object on the computer graphic display without causing the displayable object to be rotated.

46. (New) The input device according to claim 39 comprising:

switch means with the inertial gyroscopic means for manual activation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of the housing.

47. (New) The input device according to claim 43 comprising:

switch means mounted with said sensing means and said inertial gyroscopic means for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation.

48. (New) The input device according to claim 45 comprising:

switch means on said housing means for manual actuation to one operating state for selectively inhibiting producing said signal, and for actuation to another operating state for enabling producing said signal in response to said rotation of said housing means.